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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/272,303	03/19/1999	SATORU TOMARU	32307-147486	5475

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EXAMINER	
ANGEBRANNDT, MARTIN J	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 11/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/272,303	TOMARU ET AL.	
	Examiner	Art Unit	
	Martin J Angebranndt	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7/23/04 & 8/24/04*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *13-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. The response, including the declaration, provided by the applicant has been read and given careful consideration. Responses to the arguments advanced by the applicant are presented after the first rejection to which they are directed.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3 Claims 13-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The formula (I) is not recited as part of claim 13.

4 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5 Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. EP 0446672, in view of Tsukamoto et al. '715, Ueno et al. JP 09-243869, Watanabe et al. '281 and Elliott, D., "Integrated Circuit Fabrication Technology", pp125-129 (1982).

Tsukamoto et al. '715 teaches the use in the 11th embodiment, the formation of a photosensitive on a substrate followed by imagewise exposure using a mask. The use of epoxy compositions is disclosed, including EHPE-3150 which is embraced by formula I (21/43-61). In the case of the cited figures air or the substrate which each have a lower refractive index than the waveguide materials act in place of cladding layers. Photoinitiators useful with epoxies are

disclosed. (23/30-67) The use of cladding materials is disclosed. (16/42-47) The use of solvent development is disclosed. (20/29-52). The composition in table 1 contains 33.2% EPHE solids. The use of spin coating is disclosed (18/11-14). The addition of various materials for for adjusting various properties including viscosity is disclosed. (17/66-18/2)

Fan et al. EP 0446672 teaches with respect to figures 3a-e, the coating of a cladding layer, the formation of a waveguiding core using a photosensitive polymer in selected areas and the overcoating with an upper cladding layer. (12/10-44) The cladding layer are disclosed as having a lower refractive index than the waveguiding core. The use of the photosensitive epoxy epirez su8 for the waveguiding core and the use of epoxy functionalized PMMA for the cladding is disclosed. (12/37-40) As discussed in the first example, the use of spin coating for coating the photosensitive waveguiding core and the use of lithographic patterning for the exposure are disclosed (10/40-47, 10/47-53). The use of solvent development to remove undesired photosensitive material to form the ridge core is disclosed. (11/10-19). The teachings with respect to figure 2 are similar, but do not use the solvent development step. The formation of optical waveguides formed from epoxies having waveguiding layers with thicknesses of 50 microns or more is taught. (8/4-5) Example 1 at 13/3-18 has a thickness and width of 50 microns. The use of layers with thicknesses of up to several hundred microns is disclosed. (10/48-50). The use of spin coating is disclosed. (10/40-42).

Ueno et al. JP 09-243869 teaches in example 1, the formation of a epoxy based resist solution, which is dip coated onto a substrate and then irradiated with a argon ion laser to harden the liquid photoresist solution. [0018-0019].(translation attached)

Watanabe et al. '281 teaches a photoresist solution with a viscosity of 3800 cps which is spin coated at 1000 rpm for 10 seconds yield a thickness of 75 microns. (6/50-56).

Elliott, D., "Integrated Circuit Fabrication Technology", pp125-129 (1982) teaches spin coating techniques for photosensitive resist solutions, the formula indicates that the thickness is a function of rotational speed and solids content (viscosity).

It would have been obvious to one skilled in the art to modify the process of example 1 of Fan et al. EP 0446672 to use other epoxies known to be useful a waveguiding cores, such as the EPHE-3150 composition disclosed in table 1 by Tsukamoto et al. '715 and to develop them using solvents to remove the uncured portions of the epoxy waveguiding layer, such as those taught in Fan et al. EP 0446672 and to use cladding layer below and above the waveguiding core as taught by Fan et al. EP 0446672, based upon the disclosure of equivalence within the references between the solvent development and refractive index distribution techniques and the various waveguiding materials and the direction to the use of cladding layers within Tsukamoto et al. '715, further it would have been obvious to one skilled in the art to spin coat the solution at 1000 rpm to yield a coating sufficiently thick to form a multimode waveguide based upon the teachings of Watanabe et al. '281 and Elliott, D., "Integrated Circuit Fabrication Technology", pp125-129 (1982) for photosensitive photopolymers and to perform the curing without drying the coating to save time with a reasonable expectation of success based upon the disclosure of Ueno et al. JP 09-243869 of the hardening of the liquid epoxy resist without drying.

The examiner notes that the composition in table 1 of Tsukamoto et al. '715 contains 33.2% EPHE solids, which according to table 1 on page 11 of the instant specification has a viscosity in excess of 2000 cps (based upon example 5, in excess of 2500 cps). The examiner

holds that the viscosity of the solution is inherently in excess of 2500 cps and within the scope recited in the claims. The use of spin coating techniques is disclosed in both Tsukamoto et al. '715 and Fan et al. EP 0446672 and as such cannot be considered confer novelty or unobviousness. The example of embodiment 5 appears to differ from embodiment 2, in that the width dimension is 8 microns, where in the case of embodiments 1 and 2, the width is 40 and 50 microns respectively and a multimode optical waveguide is produced. Therefore all the dimensions are considered important. Clearly, there is a difference in the refractive index of the cured and uncured portion of the resin of Tsukamoto et al. '715 and there is clearly a difference in the solubility of these areas due to the difference in the degree of crosslinking/polymerization. This is supported by the teachings of Fan et al. EP 0446672. The line of reasoning is now set forth more clearly above. Clearly, the use of epoxy materials for waveguiding core is disclosed in both Tsukamoto et al. '715 and Fan et al. EP 0446672 and the utility of EPHE 3150 as a waveguiding core material is clearly appreciated in the art. Therefore it would have been obvious to one skilled in the art to modify the process of example 1 of Fan et al. EP 0446672 to use other epoxies known to be useful a waveguiding cores, such as the EPHE-3150 composition disclosed in table 1 by Tsukamoto et al. '715 and to develop them using solvents to remove the uncured portions of the epoxy waveguiding layer, such as those taught in Fan et al. EP 0446672 and to use cladding layer below and above the waveguiding core as taught by Fan et al. EP 0446672, based upon the disclosure of equivalence within the references between the solvent development and refractive index distribution techniques and the various waveguiding materials and the direction to the use of cladding layers within Tsukamoto et al. '715.

The examiner agrees that the previous combination of references did not render obvious the currently claimed invention, which now limits the exposure to taking place while the mixture containing the reactive oligomer. The previously applied references dry the coating prior to exposure. The addition of Ueno et al: JP 09-243869 addresses that. It is unclear that there is any advantage, other than the obvious time savings, attributable to the curing while in a liquid form. As evidenced by Elliott, D., "Integrated Circuit Fabrication Technology", pp125-129 (1982), the thickness of the resultant spin coating is a function of rotational speed and solids content (viscosity). The curing when dry or wet does not seem to play a function in the resulting thickness as the coatings use the liquid form. The applicant argues that the exposure/curing while wet results in a more uniformly cured product on page 7 of the response, but this does not seem to be supported by any data in the record. The applicant argues in the response that the references fail to render obvious, the claimed invention, specifically the irradiation while the photosensitive mixture is liquid. The applicant is arguing that the Ueno reference does not supply this missing part. The examiner disagrees, noting that the reference is within the waveguiding art and exposes the resist while it is in a liquid state. This establishes that this exposure technique is known in the art. The applicant points out that various oils that have the recited viscosity, but this seems irrelevant due to the fact that the solutions are no physically present to compare with the described oils. The examiner asserts that the composition in table 1 of Tsukamoto et al. '715, containing 33.2% EPHE solids is within the recited viscosity. The applicant has not provided evidence to refute this. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642

F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The declaration of Satoru TOMARU has been considered. The declarant makes a point of discussing the effects of the use of various solvents, but does not indicate that the solution of the composition in table 1 of Tsukamoto et al. '715 is outside the viscosity range. The application does contain references to scattering in sections [0005 and 0044]. Two comparative solutions of 50 and 70 wt % of EHPE were formed and had viscosities of 2000 and 4000 cps and lacked any lower cladding layer. The declaration then refers to embodiment 1 of the specification which differs in composition and has a lower cladding layer of similar composition to that of the core layer. It is not clearl how the comparative examples of the declaration are equivalent to or better than the cited example of the prior art. What seems to be missing is data, which the applicant may already have. The applicant should submit a declaration using the compositions disclosed in the various embodiments, but modify the process by drying the core films before exposure to produce comparative results and clearly comparing the scattering of the inventive and comparative examples in that declaration. The rejection stands. A showing of this type may serve to obviate the rejection of record.

The applicant states that the claims relate to three items, the composition a), the use of spin coating b) and irradiation of the composition while it is in its liquid state which allows it to yield a low scattering loss although it may be several tens of microns thick. The applicant specifically argues that the photocuring while in the liquid state yields improvements in the scattering. That applicant also argues that when THF is used as the coating solvent, the spin coated film is dry immediately upon, while when a diethylene glycol dimethyl ether is used, the

applicant infers, but does not state that the drying time is longer and therefore the scattering loss is lower. The examiner notes that the specification does not mention any solvents, particularly THF, diglymes or diethylene glycol dimethyl ether, not is their any **evidence** that the composition of table 1 of Tsukamoto et al. '715 is solid immediately upon coating. It seems reasonable from Ueno et al. JP 09-243869 that epoxy resists may be still liquid (wet) when coated. The applicant argues as if the percentages in the coating solution could exclude the solvent. There is no basis for this in the specification nor is it even a sensible assertion. It seems unreasonable to assert that the THF and dichloroethane are so volatile that they evaporate from the coating near instantaneously. While the list of illustrative liquids is interesting, the examiner does not have the composition for comparasion. To obviate this rejection the applicant could make a declaration showing either that the applicant has made the composition of Tsukamoto et al. '715 shown in table 1 and measure the viscosity showing it to be outside the claimed range or could perform the inventive process claimed where the resist is cured while in a liquid state and perform the inventive process where the composition is dried to remove the solvents prior to exposure and detail the unobvious results from the inventive process. This also would make a more defensible patent. The rejection stands.

6 Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

112 rejection.

7 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebranndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9309 for regular communications and 703-872-9309 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Martin J Angebranndt
Primary Examiner
Art Unit 1756

October 29, 2004